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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,772	10/24/2003	Laura Wills Mirkarimi	10031180-1	8958

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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 11/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/692,772	Applicant(s) MIRKARIMI ET AL.	
	Examiner Lan Vinh	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-6, 10, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Tanabe et al (US 6,893,971)

Tanabe discloses a dry etching method of an InP-based compound. The method comprises the steps of:

forming a mask on the InP-based substrate/III-V based compound (col 6, lines 1-4)

placing the InP substrate and the mask into a reactor having a pressure of 0.5 Pa/3.7 mTorr (which overlaps the claimed range between 2 mTorr to about 20 mTorr) (col 8, lines 18-20)

introducing a first gas of HI/a gas chosen from group VII gaseous species into the reactor (col 7, lines 38-40)

introducing a second gas of BCl₃ into the reactor (col 7, lines 36-37)

exposing the InP substrate/the III-V based compound to a gas plasma comprises HI and BCl₃ for deep via holes having a sidewalls etching fabrication and then make it possible to control fabrication shape into a desired shape, a mirror finish of the surface

Art Unit: 1765

can be achieved (col 9, lines 40-65; fig. 7a), which reads on exposing the InP substrate/the III-V based compound to a gas plasma comprises the first and second gas to etch smooth high aspect ratio sidewalls

The limitation of claim 2 has been discussed above

Regarding claim 3, Tanabe discloses using dry etching/RIE etching (col 4, lines 19-22)

Regarding claim 4, Tanabe discloses generating the plasma using high-frequency power and inductively coupling plasma (col1, lines 10-13)

Regarding claim 5, Tanabe discloses using a RF generator to provide power at 100-150 watts and a high frequency power at 700-900 Watts (col 10, lines 10-15)

Regarding claim 6, Tanabe discloses that the concentration of HI/first gas is 10-30% (col 3, lines 14-16)

Regarding claim 8, Tanabe discloses flowing CH₄ and H₂ into the reactor (col 9, lines 8-10)

Regarding claim 10, Tanabe discloses adjusting the temperature of the InP substrate to 50-150⁰ C (col 3, lines 42-43)

3. Claims 11-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Tanabe et al (US 6,893,971)

Tanabe discloses a dry etching method of an InP-based compound. The method comprises the steps of:

forming a mask on the InP-based substrate/III-V based compound (col 6, lines 1-4)

Art Unit: 1765

placing the InP substrate and the mask into a reactor having a pressure of 0.5 Pa/3.7 mTorr (which overlaps the claimed range between 2 mTorr to about 20 mTorr) (col 8, lines 18-20)

introducing a first gas of HI/a gas chosen from group VII gaseous species into the reactor (col 7, lines 38-40)

introducing a second gas of BCl₃ into the reactor (col 7, lines 36-37)

flowing CH₄/third gas and H₂/fourth gas into the reactor (col 9, lines 8-10)

exposing the InP substrate/the III-V based compound to a gas plasma comprises the etchants for deep via holes having a sidewalls etching fabrication and then make it possible to control fabrication shape into a desired shape, a mirror finish of the surface can be achieved (col 9, lines 40-65; fig. 7a), which reads on exposing the InP substrate/the III-V based compound to a gas plasma comprises the first, second gas, third and fourth gas to etch smooth high aspect ratio sidewalls

The limitation of claim 12 has been discussed above

Regarding claim 13, Tanabe discloses using dry etching/RIE etching (col 4, lines 19-22)

Regarding claim 14, Tanabe discloses generating the plasma using high-frequency power and inductively coupling plasma (col1, lines 10-13)

Regarding claim 15, Tanabe discloses using a RF generator to provide power at 100-150 watts and a high frequency power at 700-900 Watts (col 10, lines 10-15)

Regarding claim 16, Tanabe discloses that the concentration of HI/first gas is 10-30% (col 3, lines 14-16)

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7-9, 17-18, 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanabe et al (US 6,893,971) in view of Bhardwaj et al (US 6,261,962)

Tanabe method has been discussed above. Unlike the instant claimed inventions as per claims 7-9, 17-18, 20-21, Tanabe fails to disclose the specific concentrations/ratio of BCl₃, CH₄ and H₂ although Tanabe discloses that the flow rate of the mixed gas can be adjusted (col 10, lines 50-53)

Bhardwaj discloses a method for etching semiconductor substrate comprises the step of adjusting the flow rate of etchants such as CH₄ and H₂ (col 35-40). Bhardwaj also discloses that a parameter such as the gas flow rate may vary with the time (col 2, lines 38-42). Bhardwaj serves as an evidence that gas flow rate is a result effective variable

Hence, one skilled in the art at the time the invention was made would have found it obvious to adjust/controlling any concentration/proportion of the etchants in Tanabe method in view of Bhardwaj teaching because Bhardwaj discloses that by controlling the gas flow rate, the system can be turned in an appropriate manner to achieve good anisotropic etching with proper sidewall passivation (col 8, lines 13-17). Also, it has

Art Unit: 1765

been held that discovering an optimum value of a result effective variable involves only routine skill in the art. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CPA 1980)

Response to Arguments

6. Applicant's arguments filed 9/8/2005 have been fully considered but they are not persuasive.

The applicants argue that Tanabe et al do not disclose, suggest or teach the ability to make smooth sidewalls because the concept of "smooth sidewalls" are nowhere mentioned by Tanabe et al. Indeed, FIGs. 7b, 9a, 9b, 10a, 10b, 10c and 10d show a lateral roughness is present in contrast to the "smooth high aspect ratio sidewalls" of the present invention (see FIGs. 4a-4b of applicants' specification). This argument is unpersuasive because while it is true that the word "smooth sidewalls" is not specifically mentioned by Tanabe and FIGs. 7b, 9a, 9b, 10a, 10b, 10c and 10d of Tanabe show a lateral roughness, it is also true that Tanabe specifically discloses that "a mirror finish of the surface of the substrate 7 can be achieved and thus a damageless method can be attained and fig. 4A-4C of Tanabe show the substrate 7 having clean sidewalls. Thus, the examiner asserts that Tanabe discloses, suggests the ability to make smooth sidewalls

The Applicants argue that *In Re Boesch* states "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art" (emphasis added). Since Tanabe et al. do not disclose a process to improve sidewall smoothness because Tanabe process is not a known process to improve

Art Unit: 1765

sidewall smoothness, the rejection(s) of claims 7-9, 17-18, 20-21 under 35 U.S.C 103 (a) based on In re Boesch is not applicable. However, since the examiner maintains that Tanabe discloses, suggests the ability to make smooth sidewalls as discussed above, it is asserted that In re Boesch is applicable for the holding that discovering an optimum value of a result effective variable involves routine skill in the art as relied on in the rejection(s) of claims 7-9, 17-18, 20-21. In addition, it is noted that "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955), MPEP 2144.05 II B.

7. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action.. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 1765

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV

November 11, 2005